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ABSTRACT

The role of context in learning has taken on a new significance in recent research in that it might account for the "lost learning" that should result from the school experience, but which does not appear on normative assessments intended to measure learning in areas explicitly valued by society. A naturally occurring microworld, or pocket, in the social fabric is examined to look at the phenomenon of learning within a domain where bracketing is naturally afforded by the practices involved. Like traditional schooling, recreational scuba diving has its own formal curriculum and schooling, as well as an informal participation structure and communities of practice. Using a mix of research methods, largely ethnographic, the effectiveness of the formal diving curriculum and the Legitimate Peripheral Participation learning theory of J. Lave and E. Wenger (1992) are assessed to account for the participation patterns observed in recreational diving. Results are examined for implications in larger educational settings. Ten figures illustrate the discussion. (SLD)

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Comments welcome!! Further revisions pending.

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Diving into Communities of Practice:

Examining Learning as Legitimate Peripheral Participation in an everyday setting *.

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ABSTRACT:

The role of context in learning has come to take on a newfound significance in recent research in that it might account for the "lost learning" that is believed should be a result of the school experience, but which doesn't appear on the normative assessments intended to measure learning in those areas explicitly valued by society. Unfortunately, the type of research needed to construct an extensive account of the hidden contextual practices is virtually impossible to do across the complex and lengthy contextual arenas that form both formal and informal schooling.

This paper proposes to take advantage of a naturally occurring "microworld" or pocket in the social fabric to look at the phenomenon of learning within a domain where bracketing is naturally afforded by the practices involved there. Like traditional schooling, recreational scuba diving has its own formal curriculum and schooling; however, it also has its own informal participation structure and community(ies) of practice. Using a mix of research methods, this paper assesses the effectiveness of both that formal curriculum and the Legitimate Peripheral Participation learning theory of Lave and Wenger (Lave & Wenger, 1992) to account for the participation patterns observed within recreational diving. Those results are then examined for implications to larger educational settings.

1) Introduction, the problem of fixing both the norms and context of learning. When it comes to the topic of learning, we find ourselves in something of a dilemma which is rather mindful of the debate between the early Greek Philosophers Heraclitus and Parmenides: the former claimed that the world was constantly in flux, the other perceiving the world as never changing (Robinson,

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1968). On the one hand, researchers continue to amaze us with the enormous amount of learning activity that can be found within even comparatively short task frames (Metz, 1985) and yet, we are assailed periodically by measures such as standardized test scores which suggest that students seem to hardly learn anything.

One point of view on this paradox resolves the inconsistency by arguing that students are indeed learning as incredibly as our studies suggest, but that what they learn is not what we expect. Jean Lave provides an excellent example of this from an ethnographic study of a primary school math program (Lave, 1990). That study found that when interviewed both the children and the teacher reported themselves to be conducting what is traditionally called school math, but when actually observing the children the ethnographer found the practice of grade school children was in fact rather subversive to the mathematics curriculum, even if those practices resulted in satisfactory grades for the students.

The bizarre reality of this situation is best understood in terms of a distinction between the normative goals and actual practices of a community (Bourdieu, 1972). At the norm/expectation level, schools do prepare at least some young people for careers in the workplace. However, the practices in either institution (school, workplace) do not match up to the norms ascribed to those institutions, nor do the transition practices match the associated norms.

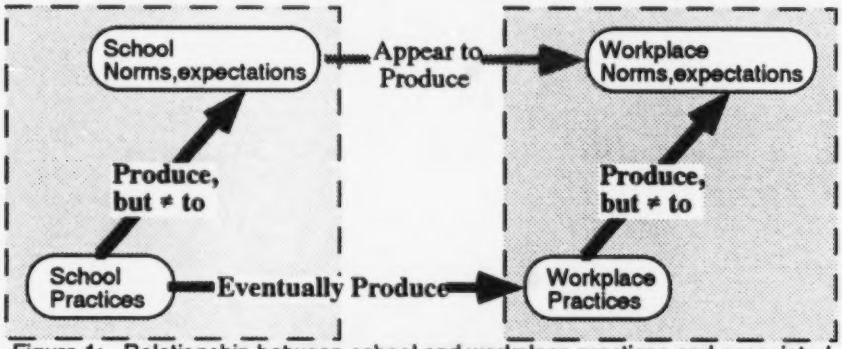

Figure 1: Relationship between school and workplace practices and associated norms and expectations

As much as research seeks to take as little for granted as possible, nevertheless most educational research takes for granted the relationship between the norms of say school

mathematics and workplace mathematics. Even more careful researchers still postulate the existence of such a link even if correspondence is no longer taken to be transparent. However, recent work in a number of fields calls into question any sort of simple link between school and workplace norms (Eckert, 1989; Latour & Woolgar, 1979; Lave & Packer, 1991; Orr, 1991; Star, 1991). Such questioning has the effect of undercutting the foundations of much research on learning, because the researcher her/himself needs to have some expectations (norms) of what constitutes learning in order to distinguish it from "noise". Such criticism can be blown out of proportion, but it does point to a need for a much more systemic account of not only learning practices, but the underlying contextual practices in which that learning is supposed to take place.

1.1) Communities of practice as "social microworlds" to study learning. The need for a more systemic account of learning within the larger social context is certainly recognized to be of great value. However, the practical problems of making such a study have essentially precluded their possibility. Simply the problems of tracking the rich socio-cultural relationship between learners and their environment over the 12+ years of schooling represents a most daunting task. Yet, that problem is only the tip of the iceberg. The workplace is no less complicated a setting and worthy of a comparable investment of time. Thus, along the time dimension alone, decades would be required to obtain one data point (trajectory of participation). That leaves a multitude of other variables unexamined from geographic to demographic to cultural.

Both in the Artificial Intelligence and Educational Software literatures there is a notion of a "microworld" (Dreyfus, 1979; Papert, 1980); however, these notions were both based on artificially produced miniatures. Yet, the social world is in fact populated with naturally occurring "microworlds". Examples of these are the family (Walkerdine, 1988), tribal groups (Bourdieu, 1972), isolated racial and ethnic groups (Laboratory of Comparative Human Cognition, 1986), and schools (Eckert, 1989).

Unlike the computer microworld, social microworlds are not in any absolute sense isolated. Larger issues of class, gender, race, and ethnicity, for example, do interact with small social groups like communities of practice (Lagache, 1992; Wenger, 1990). Nevertheless, it is possible to "bracket" particular phenomena precisely when such phenomena serve as the focus of the community. Just as participants focusing on a particular domain selectively distort and "tune out"

aspects of their larger social world (Becker, 1963), researchers can take advantage of these naturally occurring boundaries to limit their research to a more contained region of the social world.

The Legitimate Peripheral Participation model for learning within communities of practice offers not only an interesting account of what learning really involves, but it also contains a useful characterization of a space in which learning can be viewed as being "bracketed" (Lave & Wenger, 1992). A community of practice serves in this way as a microworld of the larger societal forces in place. More importantly the learning paradigm of Lave and Wenger is precisely an attempt to overcome that lack of sensitivity to the difference between declarative norms and embedded social practices. Unlike most models of learning which require an explicit accounting of not only what is to be learned but some evaluation mechanism for when learning is successful, Lave and Wenger have both what is to be learned and evaluation of successful learning bound in the local context. There is something essentially right about this view (Mishler, 1979), but it also fundamentally undermines the traditional research methodologies that require some controls in advance of running the experiment on what is learned and how one knows it has been learned. For this reason, the Lave and Wenger paradigm has been criticized as not representing a scientific account.

However, if one considers a social microworld as something of a closed system (in the limited way described above), one can substantially overcome this objection to the Lave and Wenger account. While one cannot build fixed and immutable standards for the content and criteria of learning, one can still overcome the dichotomy between reported norms and actual practices of a particular community. Since what is to be learned on the Lave and Wenger account are precisely those practices and within those practices are the mechanisms for evaluation of peripheral participants, developing an account of the practices of a community of practice is essentially the knowledge needed to evaluate the effectiveness of the Lave and Wenger account within a particular context.

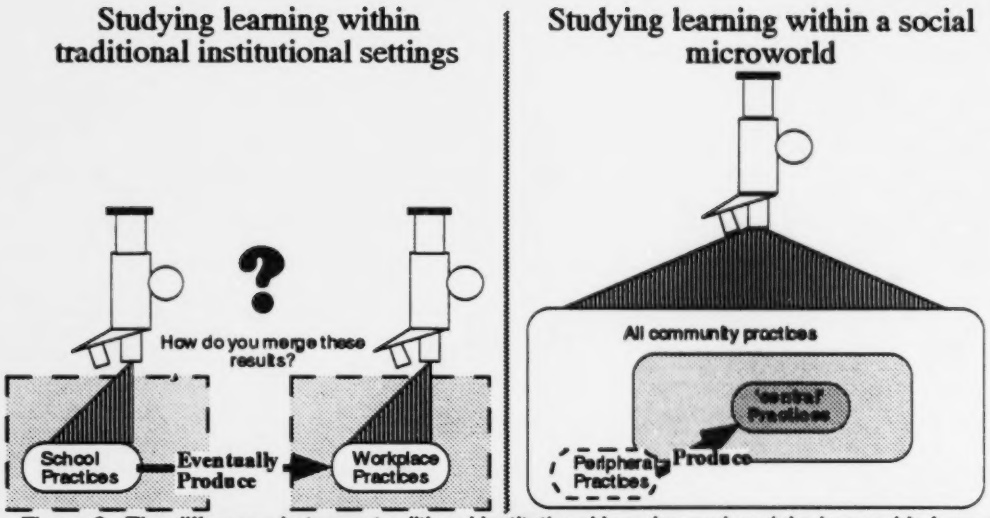

Figure 2: The difference between traditional institutional learning and social microworlds from a research perspective. Within a social microworld such as those "selected" by legitimate peripheral participation, both the learning and evaluations of successful learning are bound within the same context (Second figure after a figure by Carlock (Carlock, 1990))

Thus, research in domains that form natural social microworlds offers a substantial test of the Lave and Wenger account of learning as well as a generally useful tool to investigate the process of learning within contextually bounded systems. The work to be presented here is precisely that. It is an attempt to look at how learning occurs within a particular domain and within that particular community of practice in order to better understand not only the Lave and Wenger account but the general properties of learning within a socially bounded environment.

1.2) Some reflection on appropriate methods: As has been considerably foreshadowed by the previous discussion, it seems clear that the methods that are suitable to the investigation of learning within a the context of a social microworld like a community of practice are rather different than those used in traditional learning studies. In particular, it is no longer appropriate to seek to *control* variables. Rather what once was perceived to be under the control of the experimenter must instead be "read" from the local context.

In order to be able to use the learning criteria embedded in the local social context, it is necessary to obtain access to those participants. Since on the Lave and Wenger account those

criteria are to be found in the practices (rather than say the stated norms), it is necessary to become involved with those practices rather than, for example, simply obtaining accounts from participants. It is in this sense that one requires a "Sensitive Methodology" as Karin Knorr-Cetina describes it (Knorr-Cetina, 1981). Knorr-Cetina offers an analogy of a car connected to an engine via a clutch, but perhaps a better analogy is the researcher attempting to study motion (learning) inside a moving railroad car (community of practice). So long as the railroad car isn't moving, the researcher need not be concerned with the car itself. However, should the car start to accelerate or negotiate uneven terrain, then one must be connected to not only the phenomenon of interest, but the environment in which that phenomenon occurs.

The research methodology that suits this need best is ethnography. In the case presented here there was involved an extended participation as a member of the community of practice across multiple settings and subcommunities for over a year. This was necessary as the process of research was necessarily inductive in nature. After all, one couldn't judge the success or failure of learning until one had a grasp on what sort of learning was actually being expected of participants. In this case it was necessary to first uncover the general structure of the domain before beginning to understand how learning could come about through participation or any other means.

In order to support the ethnographic process surveys, interviewing, and other data collection support tools were implemented. Whenever practical, triangulation of data methods was used to support claims (Jick, 1983). This could be either through the use of different methods, or through the verification of data through different sources and contexts. In addition, Audit trail methodology was also used when appropriate to produce a record keeping scheme to allow other researchers to verify chains of inference (Miles & Huberman, 1984)

However, even more important in an investigation of this kind is a sensitivity to the hermeneutical nature of this sort of investigation (Packer & Addison, 1989). It is important to note not only that the subject has a particular location (a particular physical set of constraints, a particular social status, a particular stance toward other communities), but the author also came into this environment with a particular set of perspectives and interests. As noted by Peshkin (Peshkin, 1988) it is important to keep track of the author's own voice and view in the process of data collection.

None of these issues are particularly critical in and of themselves, but when fashioned together they lend considerably greater strength to the overall case presented. While, these methods cannot eliminate the subjectivity in such research, instead they offer credence to the positions taken and thus make that subjectivity valuable in its own right.

2) An introduction of the culture of recreational scuba diving, its institutions and norms.
In a university or corporation there exists an institutionalized structure. There are hierarchies and lines of authority. That structure, so well characterized by the societal icon of the *corporate ladder*, in fact extends from schooling to beyond work settings such as recreational pursuits (as we shall see). The corporate ladder of recreational scuba diving is a good point of departure for seeking to understand the diving culture. The relatively standard sequence of courses (Richardson, 1988) provides a useful point of departure.

To understand why scuba diving courses exist, it is necessary to look back into the history of diving. Back in the late fifties and early sixties, scuba diving was a new hobby practiced by sportsmen and amateur scientists alike (Ingalls, 1953). There were no controls or restrictions any more than there are restrictions on who can buy a pair of rollerblades or a telescope today.

The result can be expected given the dangers that are involved with using scuba diving equipment without some knowledge of the risk factors - a lot of injuries and deaths. Considering the lack of information and the lack of "user-friendly" equipment, the injury rate was not as severe as one might expect, but it was enough to attract the attention of government regulators (Waller,Caplan, & Lowe, 1964). According to one old-timer when that occurred there was a rapid chain of events that would forever shape recreational diving. Already a number of organizations had been formed to try to teach some basic understanding about diving (much as today, one can take classes on snow and water skiing). The first, the Los Angeles County Lifeguards, and later the National Association of Underwater Instructors (NAUI) was formed. As it turned out, the threat of regulation came not from the federal government but from the states. To the fledgling diving industry this would have been a devastating blow, since it meant that a diver traveling from one state to another would need a new certification to dive in that new state (just as doctors, teachers, and other professionals do today). However, unlike professionals who go to work in a state, already

then divers were taking diving vacations to enjoy better diving. Rather than risk the bureaucratic nightmare of a patchwork of government regulation, the diving industry initiated its own certification and self-regulation scheme and that scheme has remained in place to this day (Haas, 1991).

The key to the scheme was a simple yet very effective "chokehold" that the industry could place on those seeking to dive: Divers need compressed air for their scuba tanks, the industry simply required all filling stations to refuse service to any diver who didn't provide proof of certification from one of the reputable certification agencies. It was the need for certification instruction that turned the informal training associations into businesses and turned scuba diving from an informal hobby into a substantially institutionalized enterprise.

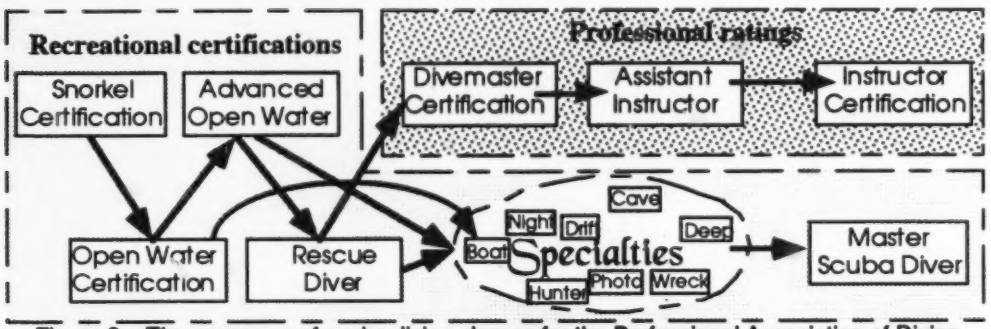

Figure 3: The sequence of scuba diving classes for the Professional Association of Diving Instructors (PADI). Other certification agencies basically offer an equivalent sequence

The sequence of coursework depends on your ultimate goals in diving. The certification industry defines two possible trajectories and two end goals. The path of entry is the same for both. While one can get a snorkeling certification, it is the Open Water Certification that is the critical passport into the diving. It is the open water certification that allows a diver to get scuba tanks filled. According to the certification agencies it is very important to continue taking classes beyond the open water course, however, curiously these courses lack a particularly strong structure.

Instructional coursework provides the only strong clue as to what might represent a normative trajectory of participation for a diving student. Again the shortness of the amateur ladder is worth reflecting on. As much as continuing education is strongly urged, there is little incentive

provided at least in the United States system. While is it very much "Not Okay" to not have a diving certification, there isn't much sense of any diving activities requiring additional training once one goes beyond that open water certification. Resorts, dive boats, even the certification agencies do not require additional coursework beyond the open water course as a prerequisite for most of their continuing education courses (PADI International, 1991). As much as the open water certification has served as the critical chokehold that has produced the business of certification agencies, there are no other equivalent "gatekeeping" functions carried out by the certification agencies with one critical exception: they also control the production of instructors which are the ultimate "engines" by which new dive students are produced. The similarity between the requirements of the open water and instructor's certification levels is quite suggestive of both the historical roots of diving instruction and the value placed on these gatekeeping functions.

2.1) Communities of practice within diving, a look at possible participation paths. It is worth noting that the preceding discussion has very little to do with what recreational divers actually do. That is in no way an accident, but is in fact a consequence of diving as a recreational activity. It in some sense would be just as strange for a certification agency to tell divers "how to have fun" diving as it would be for a television manufacturer to instruct customers on how to enjoy TV programs.

However, as much as it is inappropriate to expect institutions to dictate appropriate ways to have fun diving, it is no more reasonable to suppose that the general public has any idea of what might be satisfying activities to do as a diver. As a culture we provide more than enough support to TV purchasers so that they don't end up watching only commercials and muting out the television programming. On the other hand, most of the general public has not had the occasion to watch family or friends make a satisfying dive.

Nor would simple observation provide much insight. Tourists in Monterey often come to watch the "black rubber fish" move about the beach. Occasionally, a tourist will even be so bold as to approach the creatures and ask why they dive and what they see. Divers have some difficulty dealing with such a nebulous question. On the other hand, divers immediately know how to answer a fellow diver's question of "how was the dive". Under normal circumstances the appropriate answer is a one phrase overview evaluation of the dive followed by the visibility in feet. After that

will usually come some report on the sea conditions.

Mind you this isn't taught in any dive course. It is a practice, a practice of the diving culture. It is learned informally and more importantly exists informally. For example, this form of greeting is clearly somewhat local. Exactly where the issue of visibility ends isn't clear but for example this style of dive reporting is not common in Florida or the Côte d'Azur in France but does appear to hold true in Southern California. In Northern California where the conditions are harsh and good visibilities are rare, it is a critical decider on the quality of a dive.

One could ask the question of how divers pick this skill of appropriate dive reporting, but it would be a taunting task, and more importantly not one that would seem to be particularly helpful. While to the ethnographer or interaction analyst the transformation from inappropriate to appropriate answer to the question "how was the dive" is striking, it isn't to anyone else, especially the diving community. The landmarks that are more noteworthy are becoming a divemaster (assistant instructor and dive leader), catching that first "ling" (Ling Cod fish), or first underwater photo to win a prize. Those are the emic categories that the dive community itself uses to judge competence of new members with respect to the communities of: dive instruction, underwater hunting and underwater photography. This is precisely what the Lave and Wenger book (Lave & Wenger, 1992) is all about, using emic categories to measure learning.

But before it is possible to assess the effects of learning, one needs a "roadmap" of the possible outcomes of learning. Figure-4 is an attempt to provide exactly that based on both ethnographic observations and various landmark institutions in the local diving cultures (dive clubs, well known dive figures and so on).

The figure captures the central distinction within the diving community between 'sightseeing' and other forms of 'specialty diving'. Specialty divers represent more mature individuals because apparently they have not only mastered the art of diving, but have gone beyond that to carry out particular activities under the water. The importance of taking on a specialty is not all together clear. There is certainly a socio-historical precedence. Underwater hunters existed before there were scuba divers (Eyles, 1985). It also seems clear that it is an important part of a diver's identity to have some specialty mastered.

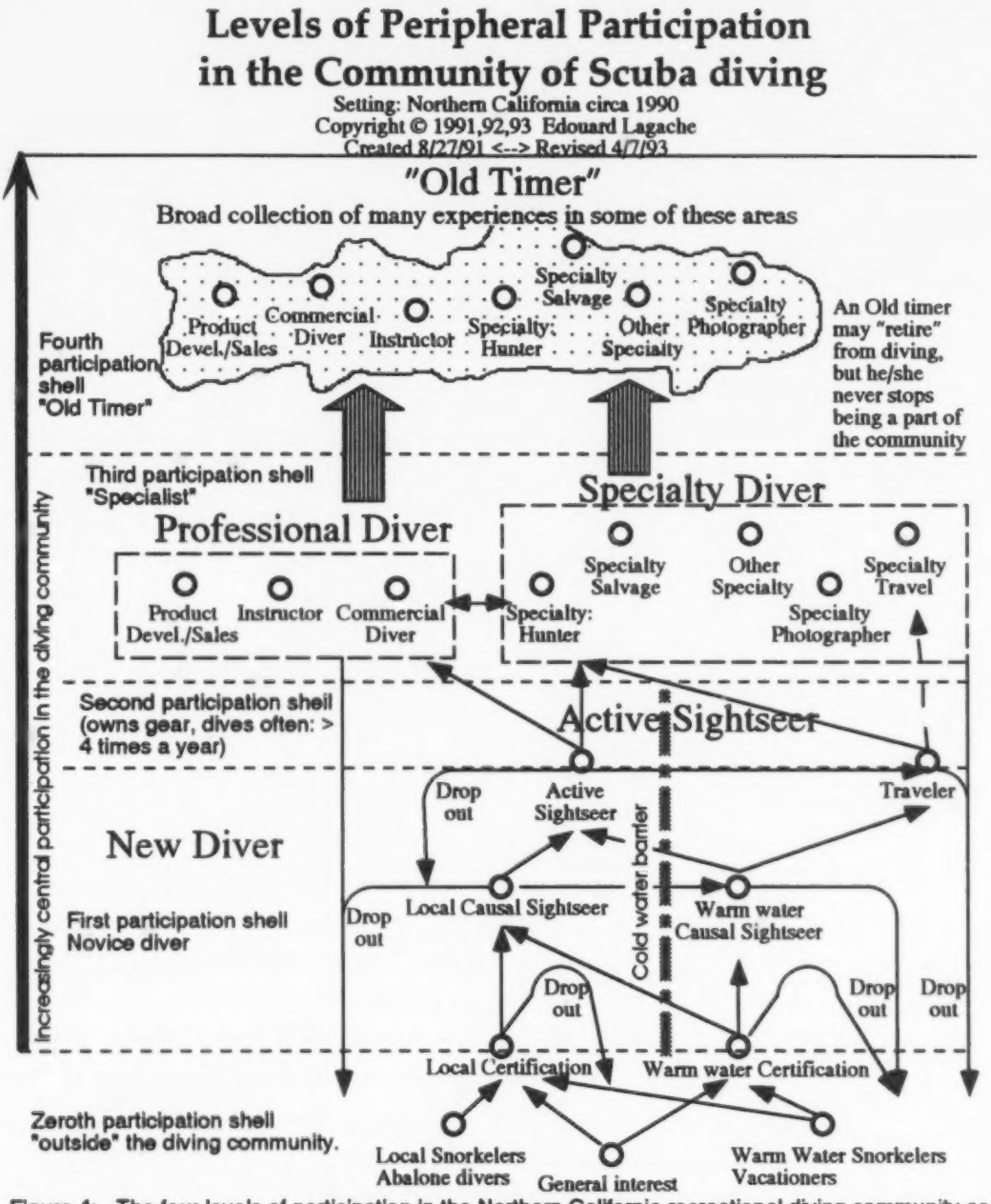

Figure 4: The four levels of participation in the Northern California recreational diving community as inferred from ethnographic observation.

Personal experience with diving suggests that there is a very simple reason: just plain diving is boring. Scuba equipment plays a role somewhat akin to that of the average car, it is a mechanism to go some place that could not otherwise be accessed. However, like a car, scuba equipment becomes a waste if not used to do something beyond simply using it.

But this distinction alone does not point to where one may find communities of practice. However, one important clue is to be found in the way some dive clubs are organized. While some clubs have no focus, others are organized around particular activities. The prominent of these in Northern California are Underwater Photography and Underwater Hunting. Ethnographic data makes quite clear that dive clubs are not communities of practice, but they do serve as institutional sites where communities of practice may reside. Also a dive club needs to be a site where open ended meaningful activities may take place. This is precisely what is necessary for a community of practice.

This isn't to say that there cannot be a community of diving practice where the practice is sightseeing, but its lack of any purpose does suggest that it might be less stable. Also, the lack of "directedness" in sightseeing poses an interesting question to an analysis using Legitimate Peripheral Participation. Since sightseeing does not admit to degrees (there isn't a better or more central way to do underwater sightseeing than any other), it isn't clear how one could find any directionality from the outside to full participants.

Figure-4 implicitly claims that there is no stable region of diving participation that involves only sightseeing. Instead, it views taking on a specialty interest as the critical transition to a more permanent membership in the community of scuba divers. Once one has established one's reputation within a particular specialty community, it is possible to make a transition to another specialty. This is due to the fact that many divers belong to more than one subcommunity. After making a few transitions and in general getting to know the diving community, one may make the last possible transition in the model to "oldtimer". Oldtimers have a diverse set of experiences in a wide range of diving activities, and like our general society notion of an oldtimer, they are more than willing to share that experience in the form of stories. Oldtimers are unique in that like retirees they are free to participate or not participate in diving as they wish. Many cannot or will not dive because of age and/or disability (including injuries caused by diving). Others return to the gentle

pastime of sightseeing because it is less strenuous than specialty diving, and that is enough to relive memories, or perhaps to share diving with a younger friend or more often family member. Still other oldtimers can be found continuing to take on some particular specialty no matter what the physical or mental difficulties.

Thus, scuba diving as a general pastime seems to have a structure moving from more peripheral to more central participation. In keeping with the Lave and Wenger characterization, we can see participation in diving taking the following structure (figure-5):

Peripheral "Levels" of Participation in the community of scuba divers

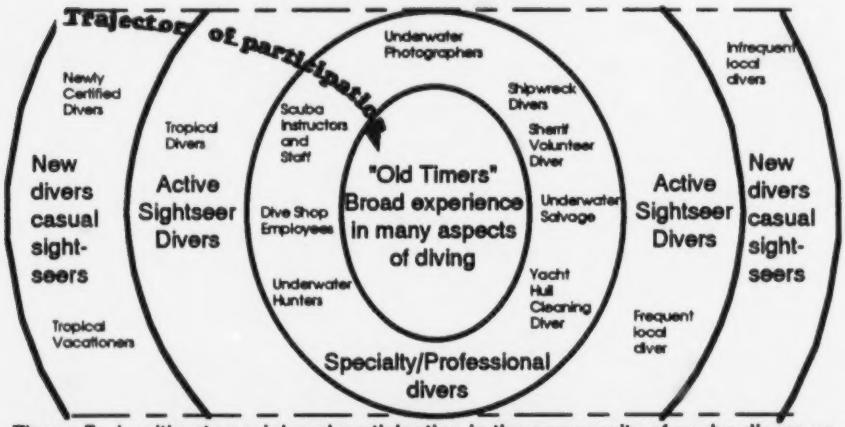

Figure 5: Legitimate peripheral participation in the community of scuba divers as movement from a newly certified diver to an "oldtimer" (after a figure by Carlock (Carlock, 1990)).

However, that is still at a rather coarse level of analysis. One could view a still smaller community of practice and examine the learning there as also involving legitimate peripheral participation. The simplest one to use for this is the community of scuba instruction since there are institutional labels for it (see figure-6), but in fact, within any specialty within diving there will have participants with varying degrees of expertise and participation.

It is common for "full time" participants in diving (such as employees of a dive store) to have a established competence in multiple subcommunities within diving. This is especially true for

instructors who must show some level of competence in every specialty that they might seek to teach. The author has worked with a number of instructors who had some competence in underwater hunting and/or underwater photography and with one instructor who had built up quite a reputation in both.

Peripheral "Levels" of Participation in the community of scuba instructors

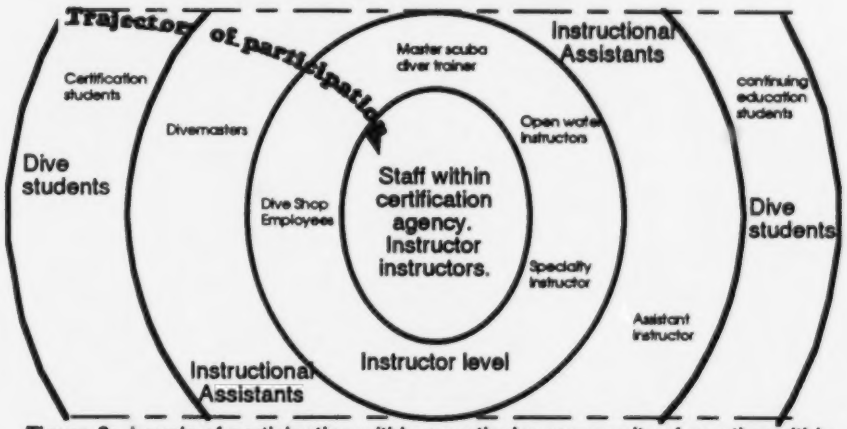

Figure 6: Levels of participation within a particular community of practice within recreational scuba diving (after a figure by Carlock (Carlock, 1990)).

It is worth taking a moment to situate myself within this world and explaining what effects that perspective might have. I can be found at the 3rd level of participation in the model of recreational diving, having become involved in two specialty areas. I am an active underwater photographer, with underwater photographic equipment and affiliations to underwater photographic clubs. I am also a member of the community of scuba instructors at the level of instructional assistants. I have served at the level of divemaster for almost a year and am working toward the assistant instructor certification.

The photographer's perspective and instructor's perspective as it turns out partition out a rather different slice of the diving community. Underwater photographers tend to be affluent and more inclined to travel to their diving. Instructors on the other hand are very active local divers, diving on as many as 3 weekends out of the month. Because most instructors either are not well paid or work at day jobs with a lower pay scale, there is also a certain effect of class consciousness. Instructors will for example naturally gravitate toward the best motel bargains in Monterey while

their clients can afford much better lodgings.

My ethnographic experiences have involved collecting data from two local dive shops, serving as an employee in one for about 9 months. In the other shop I am on the instructional staff and serve as an informal consultant. It is also worth noting what I have not experienced. I have not been directly involved in any underwater hunting (although I have been on dives with hunters). I have also not made any tropical dive trips. Although both these perspectives are represented from second hand sources.

2.2) Examining the adequacy of Legitimate Peripheral Participation. A look at participation data: The model represented in figure-4 has the soft character of ethnographic work, that is to say it was developed through interactions with the data instead of before data collection. Nevertheless it does make predictions that can be tested. One prediction it makes is that there should be a transition from divers making primarily sightseeing dive trips to making mainly dive trips which involve specialty diving.

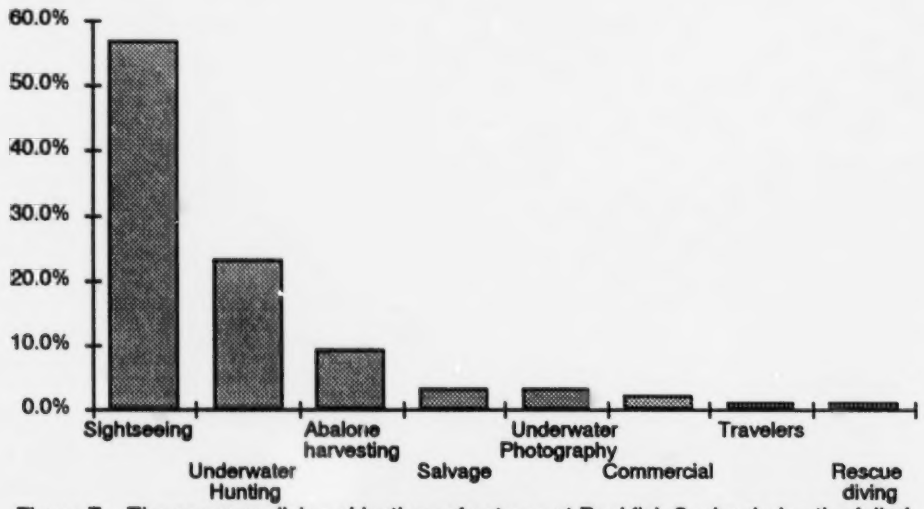

Figure 7: The common diving objectives of patrons at Rockfish Scuba during the fall of 1991.

Interview data was collected from divers who were either seeking to have air tanks filled or

seeking to rent diving equipment during the Fall of 1991 at Rockfish Scuba* The type and frequency of activities is shown on figure-7. The largest activity is sightseeing. However, that should not be a surprise since there is a very high new diver dropout rate (PADI International, 1988).

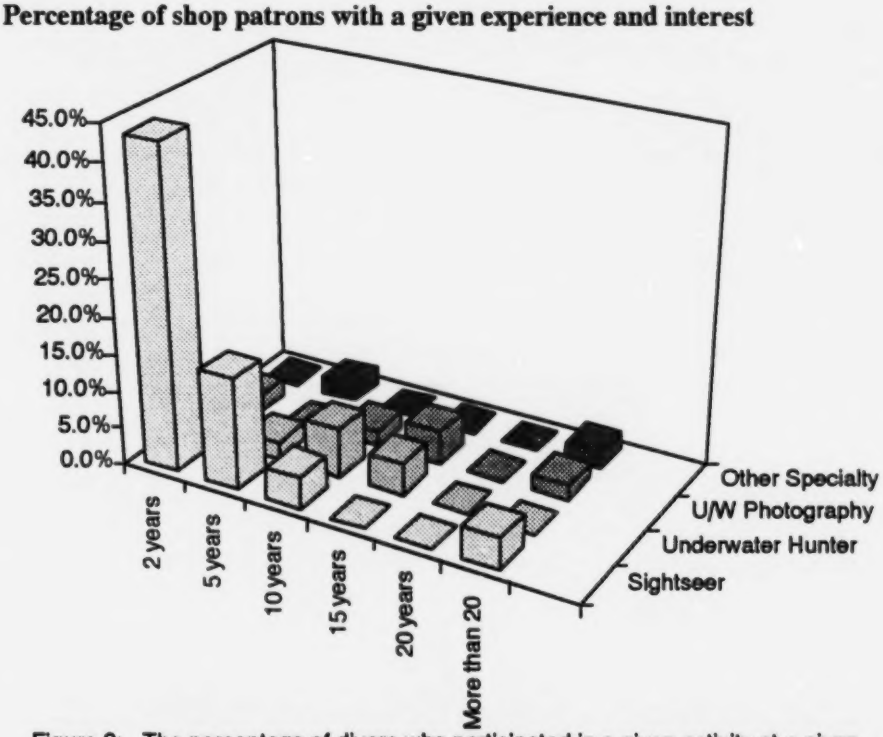

Figure 8: The percentage of divers who participated in a given activity at a given maturity (number of years in diving).

Figure-8 is taken from survey data from the same store at about the same time. It plots the percentage of divers who participated in a given activity at particular points in their diving career. It quite clearly shows that again the vast majority of shop activity was generated by newer divers who were sightseeing. However, beyond 10 years of diving experience sightseers had virtually become

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* The name *Rockfish Scuba* is a pseudonym to protect those who were/are actually involved with the ethnography site. Pseudonyms will always be used with the exception of non-region specific institutions.

extinct, while divers engaged in diving specialties predominate that "age" group. It isn't until one reaches the 20+ years in diving experience mark that sightseeing makes a comeback. At best, a 20+ year ago diver is likely to be at least 45 years old, and is more likely to be in his 50s (he is also likely to be a man since there were still very few women divers in 1968).

It is possible to sharpen the focus of this graph by considering the effects of diver dropout. Figure-9 shows the proportion of the dive shop population by number of years certified. There appears to be a rapid loss of interest early in a diver's career with a more moderated decline afterwards.

The number of years shop partrons have been certified

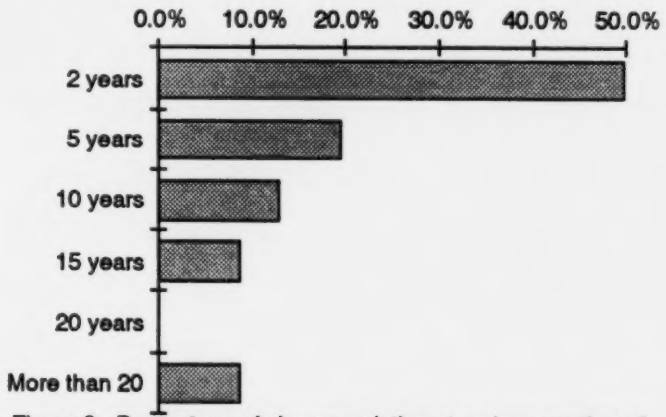

Figure 9: Percentage of shop population at a given number of years after certification.

What figure-9 suggests is that the best way to represent the data is to normalize the participation data by the total population of that diver "age group". This will represent the proportion of active divers that are engaged in that particular activity. This is what is done in figure-10.

Figure-10 clearly shows the trend found in figure-8, and expected by the diver participation model suggested here. Peripheral participation in diving as a sightseer leads to a more central participation in a diving specialty later in one's diving career. During that "middle age" in one's diving career there are only divers who are engaged in specialists activities. It is only when divers

move into "old age" that participation in specialty activities is again shared with sightseeing.

The number of divers who give up diving in the first two years is also an implicit support of the legitimate peripheral participation learning model. Divers only peripherally involved with diving have little investment of their identity in diving (Lagache, 1993b). Consequently, it is much easier for them to abandon that investment. Once divers are more centrally involved in diving (as say a specialist), their social identity is also more wrapped up in diving. If one views learning as a process of social transformation (Lave & Packer, 1991), then specialist divers have learned more, and indeed within the community of diving they are perceived to have learned more.

Normalized percentage of shop patrons with given interests and experience

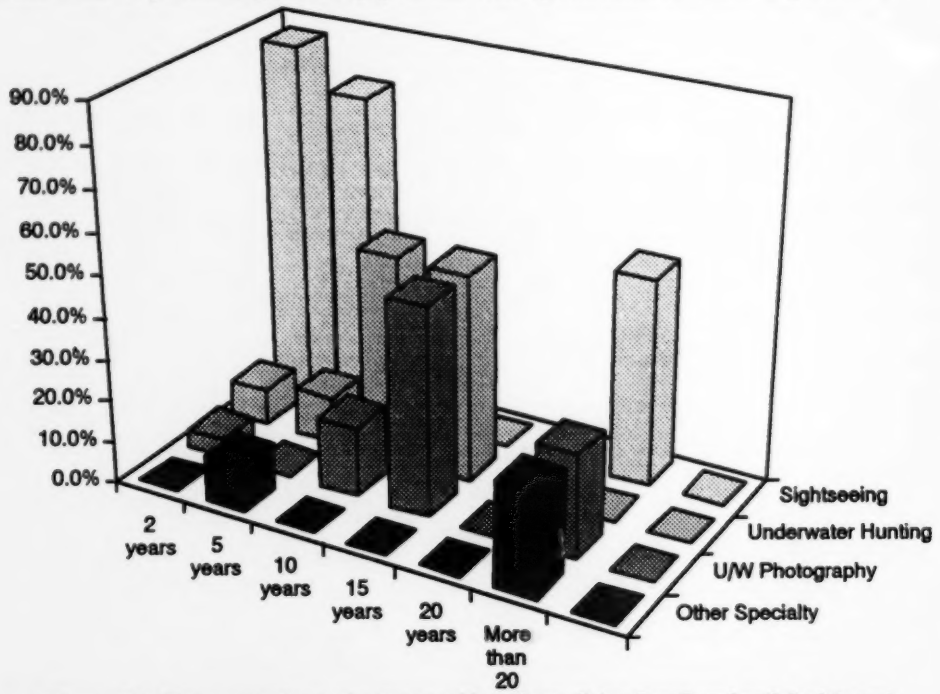

Figure 10: The percentage of patrons with a given diving "age" and activity interest normalized for the number of divers in that "age" group. (note: order of diving interests reversed to show structure of data).

3) Conclusion, learning as participation in a recreational domain. This has been at best a most cursory visit to the domain of recreational scuba diving. This has been rather necessary given

the complexity of this even rather smallish "pocket" of social activity in the societal landscape. Many textbooks exist to attempt to teach the practice of diving, it would have been most foolish to try to compress that sort of understanding into a mere paper!

However, the fact such diving textbooks exist is a matter to consider when reflecting on this particular facet of this study. In principle, the supplied textbook and the associated course materials provide dive students all the tools they need to know in order to dive. The longest recreational dive classes are still only on the order of a month or so. Even the certification agencies are not so blind as to assume one course is sufficient. Yet, it is possible for someone with no diving experience at all to be trained as a diving instructor in less than 6 months. If one can be imparted with all the diving knowledge needed to teach others in 6 months, why do divers seem to dropout after a number of years?

No matter how well a diving textbook is written, it will not contain the appropriate manner to answer the question: "how was the dive?", nor can it, because that answer is different depending on whether the question is asked in Monterey California, Jupiter Florida, or Cannes France. In a word it is context, and it is the limit beyond which institutionalized education cannot function efficiently.

However, in the field of education research one is compelled to ask the question how can one use this information. How does legitimate peripheral participation assist us in the process of teaching our children? To answer that perhaps it is wise to first answer a more direct question, how does this research help in the teaching of scuba diving?

To understand that, one needs to see the very drastic change in perspective represented here. Typical concerns about diving education involve controlling legal and safety issues (Wienke, 1992). These translate quite nicely to competence issues asked of our general student populations as expressed by standardized test scores. As much as safety is and must remain a concern, the diving industry has had a student dropout rate of over 50% (PADI International, 1988), and has basically defined the matter as falling outside the realm of instruction.

As it turns out such a point of view is probably correct. The causes of diver dropout are outside the reach of conventional diving instruction. Divers seem to drop out somewhere between 1

and 5 years after becoming certified. It would be quite difficult to devise instruction to deal with an unknown problem developing years after the instruction is complete.

However, from a legitimate peripheral participation perspective the problem isn't a mystery, on the contrary it is absolutely clear. Divers are either unwilling or unable to become involved more centrally in specialty communities of practice. When one adds fact that the dive industry has been pushing very hard to increase the number of new divers (Lagache, 1993a), we are close to making a diagnosis. Communities of practice are formed of social relations and trajectories of participation are formed through social relations as well. Increasing the number of new divers did nothing to change the existing social structure nor to equip it to take on new onslaught. Just as people can have so many friends, specialty communities of practice could support only so many new divers. The rest of the divers well, they were lost in/to the system.

Solving this problem will be more complex, but simply understanding it is quite insightful. The same processes in fact do apply to larger social settings and raise very important questions for those researchers who seek to "engineer" communities of practice in order to improve existing schools. If one takes seriously the view of learning as social transformation, then all learning from kindergarten to climbing the corporate ladder involves shifting of individual identities through networks of social relations. If that is so, then engineering communities of practice in schools will have no more effect than the diving industries attempts to pump out more dive students. While the engineered communities may spur on new understanding in science and math, they won't affect the social networks within the communities of science and math directly. As in the case of diving, those communities can only support so many people and the excess .... well let us just say their loss is considerably greater than simply to drop a hobby.

There is a second and perhaps more important point to be made: the effects of race, class , and gender to find their way into diving (Lagache, 1992). While almost 40 percent of the divers certified are women, only about 25 to 30 percent of the active divers are women, and one underwater hunting club maintains its unwritten policy of no women members. Attempts to "engineer" communities of practice in our schools will in no way spare those students from similar effects once they leave their "social incubators". The obstacles faced today by our young minorities will continue to be faced at the critical times when careers are dictated, quite independently of what

experiences bought those students to those barriers (Ogbu, 1990; Turkle, 1988).

The "microworld" of diving may seem quite far a field from the present day worries of our modern life. Indeed that is one of its main attractions. However, human beings are forever tethered to their history, and they bring their baggage of biases, dreams, hopes, loves and hatreds wherever they go. Understanding how that baggage gets negotiated in that distant pocket of human affairs has much more to tell us about ourselves than perhaps we are comfortable knowing.

Edouard Lagache, April 4, 1993

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